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TABLE 2 TO APPENDIX I.—PRIMARY TIER 2 EMISSION STANDARDS FOR COMMERCIAL AND RECREATIONAL MARINE ENGINES AT OR ABOVE 37 kW (G/KW-HR)

Engine size liters/cylinder	Maximum engine power	Category	Model year	NO _x + THC g/kW-hr	CO g/kW-hr	PM g/kW-hr
disp. < 0.9	power ≥ 37 kW	Category 1 Commercial ...	2005	7.5	5.0	0.40
		Category 1 Recreational ..	2007	7.5	5.0	0.40
0.9 ≤ disp. < 1.2 ...	All	Category 1 Commercial ...	2004	7.2	5.0	0.30
		Category 1 Recreational ..	2006	7.2	5.0	0.30
1.2 ≤ disp. < 2.5 ...	All	Category 1 Commercial ...	2004	7.2	5.0	0.20
		Category 1 Recreational ..	2006	7.2	5.0	0.20
2.5 ≤ disp. < 5.0 ...	All	Category 1 Commercial ...	2007	7.2	5.0	0.20
		Category 1 Recreational ..	2009	7.2	5.0	0.20
5.0 ≤ disp. < 15.0	All	Category 2	2007	7.8	5.0	0.27
15.0 ≤ disp. < 20.0	power < 3300 kW	Category 2	2007	8.7	5.0	0.50
	power ≥ 3300 kW	Category 2	2007	9.8	5.0	0.50
20.0 ≤ disp. < 25.0	All	Category 2	2007	9.8	5.0	0.50
25.0 ≤ disp. < 30.0	All	Category 2	2007	11	5.0	0.5

(3) *Tier 2 supplemental standards.* Not-to-exceed emission standards apply for Tier 2 engines as specified in 40 CFR 94.8(e).

APPENDIX II TO PART 1042—STEADY-STATE DUTY CYCLES

(a) The following duty cycles apply as specified in § 1042.505(b)(1):

(1) The following duty cycle applies for discrete-mode testing:

E3 mode No.	Engine speed ¹	Percent of maximum test power	Weighting factors
1	Maximum test speed	100	0.2
2	91%	75	0.5
3	80%	50	0.15
4	63%	25	0.15

¹ Speed terms are defined in 40 CFR part 1065. Percent speed values are relative to maximum test speed.

(2) The following duty cycle applies for ramped-modal testing:

RMC mode	Time in mode (seconds)	Engine speed ^{1,3}	Power (percent) ^{2,3}
1a Steady-state	229	Maximum test speed	100%.
1b Transition	20	Linear transition	Linear transition in torque.
2a Steady-state	166	63%	25%.
2b Transition	20	Linear transition	Linear transition in torque.
3a Steady-state	570	91%	75%.
3b Transition	20	Linear transition	Linear transition in torque.
4a Steady-state	175	80%	50%.

¹ Speed terms are defined in 40 CFR part 1065. Percent speed is relative to maximum test speed.

² The percent power is relative to the maximum test power.

³ Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode, and simultaneously command a similar linear progression for engine speed if there is a change in speed setting.

(b) The following duty cycles apply as specified in § 1042.505(b)(2):

(1) The following duty cycle applies for discrete-mode testing:

E5 mode No.	Engine speed ¹	Percent of maximum test power	Weighting factors
1	Maximum test speed	100	0.08
2	91%	75	0.13
3	80%	50	0.17
4	63%	25	0.32

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E5 mode No.	Engine speed ¹	Percent of maximum test power	Weighting factors
5	Warm idle	0	0.3

¹ Speed terms are defined in 40 CFR part 1065. Percent speed values are relative to maximum test speed.

(2) The following duty cycle applies for ramped-modal testing:

RMC mode	Time in mode (seconds)	Engine speed ^{1,3}	Power (percent) ^{2,3}
1a Steady-state	167	Warm idle	0.
1b Transition	20	Linear transition	Linear transition in torque.
2a Steady-state	85	Maximum test speed	100%.
2b Transition	20	Linear transition	Linear transition in torque.
3a Steady-state	354	63%	25%.
3b Transition	20	Linear transition	Linear transition in torque.
4a Steady-state	141	91%	75%.
4b Transition	20	Linear transition	Linear transition in torque.
5a Steady-state	182	80%	50%.
5b Transition	20	Linear transition	Linear transition in torque.
6 Steady-state	171	Warm idle	0.

¹ Speed terms are defined in 40 CFR part 1065. Percent speed is relative to maximum test speed.

² The percent power is relative to the maximum test power.

³ Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode, and simultaneously command a similar linear progression for engine speed if there is a change in speed setting.

(c) The following duty cycles apply as specified in § 1042.505(b)(3):

(1) The following duty cycle applies for discrete-mode testing:

E2 mode No.	Engine speed ¹	Torque (percent) ²	Weighting factors
1	Engine Governed	100	0.2
2	Engine Governed	75	0.5
3	Engine Governed	50	0.15
4	Engine Governed	25	0.15

¹ Speed terms are defined in 40 CFR part 1065.

² The percent torque is relative to the maximum test torque as defined in 40 CFR part 1065.

(2) The following duty cycle applies for ramped-modal testing:

RMC mode	Time in mode (seconds)	Engine speed	Torque (percent) ^{1,2}
1a Steady-state	234	Engine Governed	100%.
1b Transition	20	Engine Governed	Linear transition.
2a Steady-state	571	Engine Governed	25%.
2b Transition	20	Engine Governed	Linear transition.
3a Steady-state	165	Engine Governed	75%.
3b Transition	20	Engine Governed	Linear transition.
4a Steady-state	170	Engine Governed	50%.

¹ The percent torque is relative to the maximum test torque as defined in 40 CFR part 1065.

² Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode.

APPENDIX III TO PART 1042—NOT-TO-EXCEED ZONES

(a) The following definitions apply for this Appendix III:

(1) *Percent power* means the percentage of the maximum power achieved at Maximum

Test Speed (or at Maximum Test Torque for constant-speed engines).

(2) *Percent speed* means the percentage of Maximum Test Speed.

(b) Figure 1 of this Appendix illustrates the default NTE zone for commercial marine engines certified using the duty cycle specified

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in § 1042.505(b)(1), except for variable-speed propulsion marine engines used with controllable-pitch propellers or with electrically coupled propellers, as follows:

(1) Subzone 1 is defined by the following boundaries:

- (i) Percent power $\geq 0.7 \cdot (\text{percent speed})^{2.5}$.
- (ii) Percent power $\leq (\text{percent speed}/0.9)^{3.5}$.

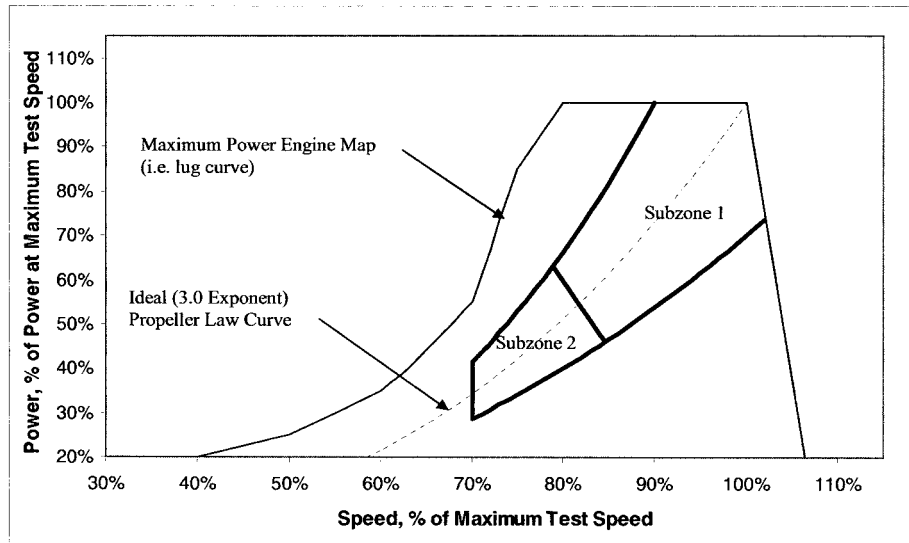
(iii) Percent power $\geq 3.0 \cdot (100\% - \text{percent speed})$.

(2) Subzone 2 is defined by the following boundaries:

- (i) Percent power $\geq 0.7 \cdot (\text{percent speed})^{2.5}$.
- (ii) Percent power $\leq (\text{percent speed}/0.9)^{3.5}$.
- (iii) Percent power $< 3.0 \cdot (100\% - \text{percent speed})$.
- (iv) Percent speed ≥ 70 percent.

Figure 1 of Appendix III — NTE Zone and Subzones for Propeller-Law Commercial

Marine Engines



(c) Figure 2 of this Appendix illustrates the default NTE zone for recreational marine engines certified using the duty cycle specified in § 1042.505(b)(2), except for variable-speed marine engines used with controllable-pitch propellers or with electrically coupled propellers, as follows:

(1) Subzone 1 is defined by the following boundaries:

- (i) Percent power $\geq 0.7 \cdot (\text{percent speed})^{2.5}$.
- (ii) Percent power $\leq (\text{percent speed}/0.9)^{3.5}$.
- (iii) Percent power $\geq 3.0 \cdot (100\% - \text{percent speed})$.

(iv) Percent power ≤ 95 percent.

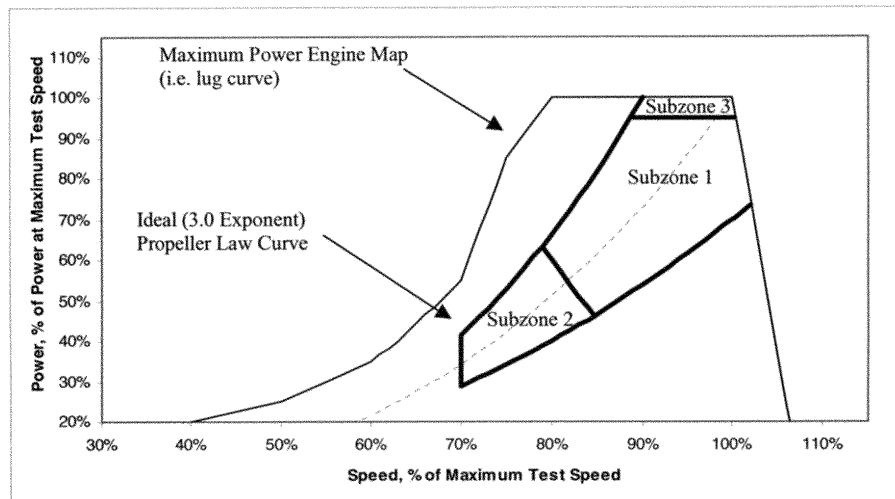
(2) Subzone 2 is defined by the following boundaries:

- (i) Percent power $\geq 0.7 \cdot (\text{percent speed})^{2.5}$.
- (ii) Percent power $\leq (\text{percent speed}/0.9)^{3.5}$.
- (iii) Percent power $< 3.0 \cdot (100\% - \text{percent speed})$.
- (iv) Percent speed ≥ 70 percent.

(3) Subzone 3 is defined by the following boundaries:

- (i) Percent power $\leq (\text{percent speed}/0.9)^{3.5}$.
- (ii) Percent power > 95 percent.

Figure 2 of Appendix III — NTE Zone and Subzones for Propeller-Law Recreational Marine Engines



(d) Figure 3 of this Appendix illustrates the default NTE zone for variable-speed marine engines used with controllably-pitch propellers or with electrically coupled propellers that are certified using the duty cycle specified in § 1042.505(b)(1), (2), or (3), as follows:

(1) Subzone 1 is defined by the following boundaries:

- (i) Percent power $\geq 0.7 \cdot (\text{percent speed})^{2.5}$.
- (ii) Percent power $\geq 3.0 \cdot (100\% - \text{percent speed})$.
- (iii) Percent speed ≥ 78.9 percent.

(2) Subzone 2a is defined by the following boundaries:

- (i) Percent power $\geq 0.7 \cdot (\text{percent speed})^{2.5}$.

(ii) Percent speed ≥ 70 percent.

(iii) Percent speed < 78.9 percent, for Percent power > 63.3 percent.

(iv) Percent power $< 3.0 \cdot (100\% - \text{percent speed})$, for Percent speed ≥ 78.9 percent.

(3) Subzone 2b is defined by the following boundaries:

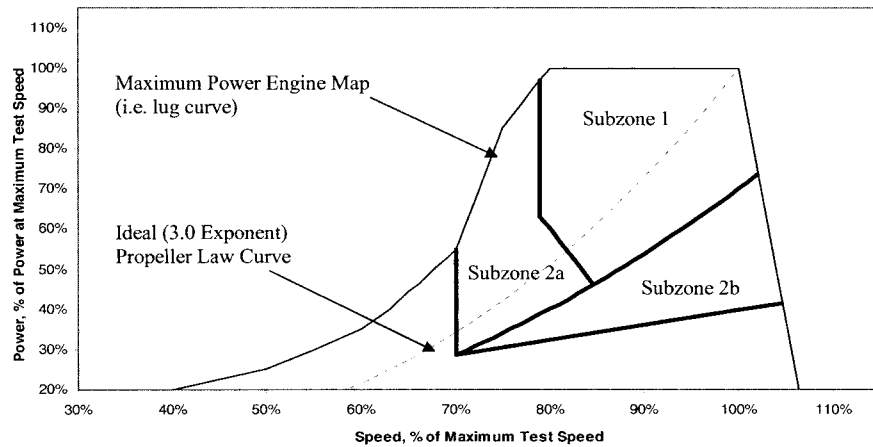
(i) The line formed by connecting the following two points on a plot of speed-vs.-power:

(A) Percent speed = 70 percent; Percent power = 28.7 percent.

(B) Percent speed = 40 percent at governed speed; Percent power = 40 percent.

- (ii) Percent power $< 0.7 \cdot (\text{percent speed})^{2.5}$.

Figure 3 of Appendix III — NTE Zone and Subzones for Variable-Pitch or Electronically
Coupled Engines*



*shown for engines capable of operating on the E3 Duty Cycle

(e) Figure 4 of this Appendix illustrates the default NTE zone for constant-speed engines certified using a duty cycle specified in § 1042.505(b)(3) or (b)(4), as follows:

(1) Subzone 1 is defined by the following boundaries:

(i) Percent power ≥ 70 percent.

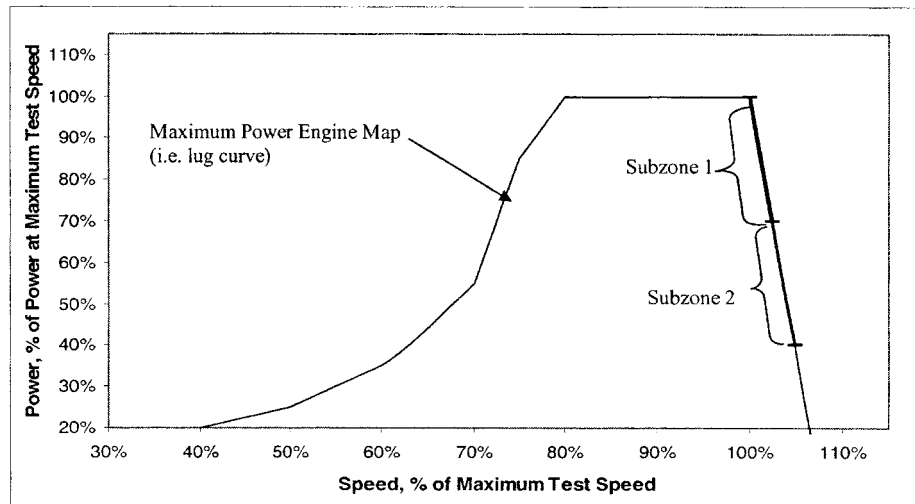
(ii) [Reserved]

(2) Subzone 2 is defined by the following boundaries:

(i) Percent power < 70 percent.

(ii) Percent power ≥ 40 percent.

Figure 4 of Appendix III — NTE Zone and Subzones for Constant-Speed Marine Engines



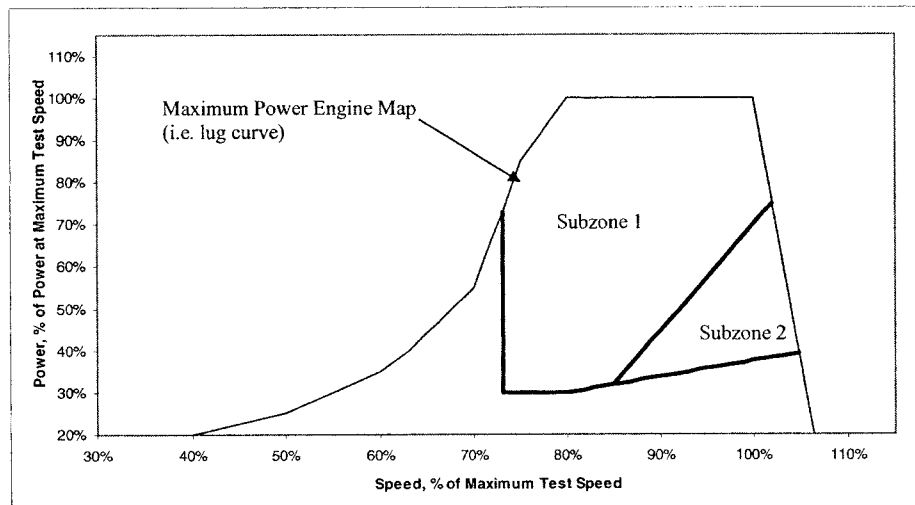
(f) Figure 5 of this Appendix illustrates the default NTE zone for variable-speed auxiliary marine engines certified using the duty cycle specified in § 1042.505(b)(5)(ii) or (iii), as follows:

(1) The default NTE zone is defined by the boundaries specified in 40 CFR 86.1370-2007(b)(1) and (2).

(2) A special PM subzone is defined in 40 CFR 1039.515(b).

Figure 5 of Appendix III — NTE Zone and Subzones for

Variable-Speed Auxiliary Marine Engines (nonpropeller-law)



PART 1048—CONTROL OF EMISSIONS FROM NEW, LARGE NONROAD SPARK-IGNITION ENGINES

Subpart A—Overview and Applicability

Sec.

1048.1 Does this part apply to me?

1048.5 Which engines are excluded from this part's requirements?

1048.10 How is this part organized?

1048.15 Do any other regulation parts affect me?

1048.20 What requirements from this part apply to excluded stationary engines?

Subpart B—Emission Standards and Related Requirements

1048.101 What exhaust emission standards must my engines meet?

1048.105 What evaporative emissions standards and requirements apply?

1048.110 How must my engines diagnose malfunctions?

1048.115 What other requirements must my engines meet?

1048.120 What warranty requirements apply to me?

1048.125 What maintenance instructions must I give to buyers?

1048.130 What installation instructions must I give to equipment manufacturers?

1048.135 How must I label and identify the engines I produce?

1048.140 What are the provisions for certifying Blue Sky Series engines?

1048.145 Are there interim provisions that apply only for a limited time?

Subpart C—Certifying Engine Families

1048.201 What are the general requirements for obtaining a certificate of conformity?

1048.205 What must I include in my application?

1048.210 May I get preliminary approval before I complete my application?

1048.220 How do I amend the maintenance instructions in my application?

1048.225 How do I amend my application for certification to include new or modified engines?

1048.230 How do I select engine families?

1048.235 What emission testing must I perform for my application for a certificate of conformity?

1048.240 How do I demonstrate that my engine family complies with exhaust emission standards?

1048.245 How do I demonstrate that my engine family complies with evaporative emission standards?